

Minutes of Life Support Conference

24-25 January 1972

Washington, D.C.

Attendees:

[Redacted box]

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1. Introduction and Opening Remarks:

[Redacted] opened the meeting with a brief resume of the trip to the Houston, Texas, Manned Spacecraft Center. Many of the Group were unable to make the NASA visit and the Grp Chairman, [Redacted] passed out the literature which was received in Houston. Comments were made by [Redacted] and [Redacted] who suited up in the Apollo garment. Mobility was the most impressive feature of the NASA suit followed by crewmember visibility. NASA philosophy on suit use can be generally stated as one pressure suit for one space mission. For this reason rubber convolutions are provided for joint flexion, however, repeated use results in rapid degradation greatly reducing service life.

Text Abbreviations:

[Redacted]
PPA - Pilot's Protective Assembly
LAC - Lockheed Aircraft Corporation
EWO - Emergency War Order
SAR - Search and Rescue

- 2 -

2. Omni-Environmental Assembly

25X1 [] of David Clark Company presented the results of the omni-environmental study on the S1010 PPA helmet and the proposed delivery date of a test piece of hardware in late March 1972. This review was accomplished by discussion of the selected subjects listed below with a brief summary of each:

a. Visibility in vertical Plane - accomplished by relocation of breathing regulator - movement of breathing regulator back to the helmet, repositioning of feeding port to the side of the helmet rather than centerline. Replacement of the bailer bar with a cam adjustment knob on the side of the helmet. Sealing feature of the visor to be relocated on the visor, itself, rather than on the shell. These features should provide for downward vision as high as mid-chest. Repositioning of the feeding port will not adversely affect the feeding of the pilot even if semi-solid food is used.

b. Horizontal Mobility - The rotating bearing is to be isolated from the helmet disconnect and the existing radial bearing is to be replaced with a thrust bearing. Caged balls will be implemented here using only necessary numbers rather than having the ball-to-ball friction mechanical advantage as it is now.

c. Helmet Comfort and Ventilation - Total weight reduction of the helmet should provide increased comfort. Incorporation of sandwich-type construction along with bailer-bar removal will reduce the total helmet weight on the order of 1 1/2 pounds despite relocation of the breathing regulator back into the helmet. Proposed replacement of the cap-style inner linner with a suspension system including top pad. Additionally, ventilation ducts can now be run over the top of the head. Flexible-type construction will be the result of this total effort similar to the aircraft-wing principal without loss of the pressure forces necessary for protection.

- 3 -

d. Emergency Face-Plate Heat - Improvement by utilization of an oxygen-spray bar. Relocation of the breathing regulator will again permit this procedure and with proper spraying, the age-old problem of eye irritation can be eliminated. This will of course augment the existing electrical system.

e. Hypoxia-Warning Indicator - Apparently there is no acceptable system to warn pilot in time for him to take corrective action. May have possible application in a [] system. [] informed the group that AF had polled various commands and no requirement existed for such a device. This topic considered closed for this working group.

25X1

f. Visor-Anti-Reflectance Coating -

Almost no good coating with a poly-carbonate visor. Redundant wires imbedded into the visor will serve as anti-fog protection in addition to the oxygen-spray bar.

g. Microphone Mounting - Noise-cancelling characteristic a prime consideration in this area. Mike will be mounted on the face barrier and will require two (2) microphones. Interest in best communication; feeding port matchup, etc., are secondary considerations. Shell mounting not optimum because of loss of noise-cancelling characteristic.

h. Face Barrier - This will remain as the type of face engagement since we in this system are not afforded the luxury of a 100% O₂ wash as in the NASA System. The added use of helmet ventilation will be gained by retaining the face barrier principal. Maintainability should be improved by mechanical engagement rather than with cementing.

- 4 -

25X1 i. Helmet Disconnect - A bold new approach here. Increased internal diameter without changing the external diameter. Use a soft-type approach flexible ring engaged with suit and a choker holds ring in place. Mock-up pressurized to 5 psi without failure. Alternative, if this effort fails, is to return to effort - a metal housing engagement with spreading action much like automobile piston ring.

j. New electrical connection - A 19 pin connector allowing for additional separate circuits. This will be especially helpful with redundant wiring. 19 pins will provide spare circuits and no soldering will be used, only mechanical connection.

Footnote: Testing of helmet discussed above to be conducted at Detachment "G".

- 5 -

3. Suit-Data Bank

Collection of data has been progressing from the various users and forwarded to the Warner Robins Depot. At this time it is not clear what useful application there is for this data. This information falls under the loose heading of soft data which is difficult to submit into a computer system. [] will address this problem and whether or not the continued effort will be sustained and what gainful reward there could be from such an effort. A card file is presently being kept on some 400 line items and [] has provided all of the AF depot data in somewhat of a different but acceptable format. [] of the David Clark Company has provided all of the data on the SR-71 system. Cross feeding of information does seem to have some merit especially outside of the special projects' area. An obvious problem has been demonstrated here in that no single source now has control or influence in presenting all pressure-suit-user advancements and/or problems. The Pressure-suit Coordinating Committee addresses itself only to the straight AF users and not to the operational special projects.

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4. Leak-Rate S1010 PPA

Much confusion exists on the correct testing and the varied tests required of this garment. A meeting between the users and the [] should resolve this problem prior to the next Life-support Working Group meeting. Currently, there are three (3) checks: a pre-flight, post flight, and periodic; and these tests are accomplished at three (3) different pressures. The desire is to check at one (1) pressure preferably the maximum pressure. Maximum figures are needed to provide the user with a more suitable testing procedure which will still not compromise pilot safety but allow PE Personnel to accomplish a reasonable, safe check of the pressure suit. Much of the above problem will be resolved with the introduction of a calibrated orifice into the controller.

25X1

- 6 -

5. S1010 PPA Glove Cooling

Very little cooling in the gloves and glove integrity leave much to be desired -- Possible redirection of some of the available ventilation. Impossible to make the glove bulky at the expense of dexterity of the fingers in the pressurized state. Additional vent may be provided to the knuckles. Beyond this the extension to the fingers would be too costly in terms of tactile discrimination. A major effort in redesign is to be accomplished in this area. One (1) option is to redirect some of the available vent air by shunting some of that air from the torso or leg area to the glove.

6. Flash Blindness

25X1 [] reported that there is still a requirement for protection from this threat. Gold visors are available and in use in SAC as well as monocular eye patches. The 15% lens is also acceptable as a substitute in an EWO mission. Gold visors in comparison allow only 2% penetration. 15% visor penetration protection is acceptable if immediate takeoff is indicated.

7. Poly-carbonate Visor

First used in the Gemini Program - Optically a very difficult situation to handle - scratches very easily and almost no de-fog capability. Additionally significant is the 50-60% reject figure on delivery. Conductive coating unsolvable problem within present state of the art. May approach de-fog by imbedding wires and conductive heating rather than by conductive coating. Industrial Safety also quite interested in this art with the application to goggles for some indestructible material that will resist scratching.

8. S1010 PPA Pressure Sealing Closure

Closure has been engineered for NASA years ago for the Gemini Program. Money will be necessary for completing the engineering effort for a 22" closure with two (2) sets of lips. No redundant closure would be necessary if this unit were utilized. Status is that tooling and production costs would still be required and a limited

- 7 -

application is obvious. Some [] would be needed to complete this tooling effort alone.

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9. Anti-Reflectance - SR-71 (Outer Cover)

[] reported that a brownish black outer cover has been test flown and found to be acceptable especially at very low sun angles. At this time a request for six (6) more garments has been made and the choice remains a pilot option. No significant change in comfort with heat profile - chamber studies between white outer garment and the black. Application strictly to SR-71.

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10. UCD Clip

Closed - Clip has been accepted. Two (2) clips are now available.

11. Automatic Inflation Device

Closed - Established as an acceptable item - testers being fabricated now. Depot has placed tester on order. LAC presently servicing the automatic inflators.

12. Automatic Seat-Kit Deployment

The survival kit presently being used has a non-automatic deployment system. [] Kansas City, Kansas, manufactures a Fixed Distance Radar (FDR) sensor which is being used on supply drops to deploy the parachutes a fixed distance above the terrain. A survival kit has been loaned to [] to determine if the device can be adapted to deploy the kit. Engineers were of the opinion that the FDR device could be adapted to the present survival kit. [] is modifying one (1) survival kit for tests and evaluation.

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13. Seat Kit

Closed Item - ECP on Survival Kit inspection device - approved buy for five (5). LAC has already purchased one (1) and SR-71 program has bought three (3). Tech Manual requires inspection with this or an equal tester. A new

- 8 -

seat kit with a drop in oxygen system has been contracted for the SR-71 Program. No automatic feature either but capability exists for retro-fit.

14. Life Rafts

A Service Bulletin has been issued by the David Clark Company to provide instruction and materials to paint the bottom of the one-man life rafts flat black. This action was taken in response to the published results (Study) of a thorough research project on shark attack. It appears that any brightly colored materials attract the killer shark. By changing the color on the bottom of the raft to black, some margin of protection may be afforded a crewmember.

25X1

15. Solid State O₂

Life Support SPO is active in this area developing a self-contained oxygen mask with a cannister or chlorate candle generator. To be used on C-9 or KC 135 aircraft. O₂ to be provided for approximately twenty (20) minutes. More significant is SPO development of an open-loop O₂ system (Navy and AF) to be used on fighter aircraft concentrate O₂ from ambient air. Currently a four-phase program. Phase one (1) already successfully concluded. If developed, would revolutionize O₂ systems. Can be generated chemically or electrically. FAA also quite active in solid state O₂ for airline application.

16. Ground Training

[redacted] reported on the parasail training program to be conducted for the pressure-suit pilots this summer at the Homestead AFB Water Survival School. Training suits are now available and credit will be given pilots for previous schools attended. For those who qualify above, a short course limited to pressure suit, para-sailing will be provided.

17. Six-Line Release

The final report from the LAC on the six-line release was discussed. The LAC conclusion on this parachute modification was that nothing was to be gained by modification

- 9 -

and that in fact pilot survivability might be compromised. This conclusion was difficult for the group to accept in the fact of overwhelming evidence to the contrary by the AF Safety Office with respect to the four-line release. This report will be challenged and some justification required of the position since no structural degradation of the chute occurred during the testing. The final result was based entirely on the El Centro jumper critiques.

18. Survival Equipment

25X1 Discussion on a survival weapon for the SAC survival kits. [] attempting to remove U-2 and SR-71 Life Support from routine control by SAC Life Support Council. Both Beale AFB and Davis Monthan AFB recommend removal of the survival rifle but Beale AFB wishes to replace rifle with 38 caliber pistol. Davis Monthan AFB on the other hand wishes to reserve the right to place the rifle somewhere else on the aircraft. There is a faction at SAC Headquarters that still wants to require the survival weapon as a mandatory item in the kit. Few documented survival episodes in which the survival weapon has been used. Printing of this new SAC Regulation is presently in hold status - SAC Reg. 60-8. Rifle does still remain in the kits at O.L. Stations, but has been at least temporarily removed from State -side locations. SR-71 crews would prefer 38 pistol somewhere on the pressure suit. A new weapon was shown, manufactured by Space Age Controls in Palmdale, California, that may serve as the future survival weapon. A 22- caliber weapon with bird-shot ammunition. No buy has been made and the factory has not tooled up as yet.

19. Future Modifications

25X1 Solid Food - [] effort to provide solid food to chew on rather than eating the paste-type food presently in use. [] will receive delivery of some of this food and distribute it to the users for pilot evaluation.

20. Exhalation Valve Mechanical Housing

25X1 This unit was demonstrated by [] David Clark Company. This is a stamped metal housing held in

25X1

- 10 -

place with a snap ring using the standard exhalation valve with no ring. Tooling is currently in process.

21. Portable Visor Face-Heat Package

A rechargeable battery and package being put together as a prototype - good for about 30 - 45 minutes - controllable. No estimate of what size; may be 4" x 5" x 2".
0 to maximum heat for visor for at least 1/2 hour.

22. Low-Flight Harness Regulator Mounted on Right Shoulder

Possible solution to U R of recent oxygen house routing and potential interference with yoke of aircraft. LAC engineers have already accepted this relocation of the oxygen regulator to the shoulder. Another solution to the oxygen-hose routing problem introduced by [] was to install a boom mike on the low-flight helmet.

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23. Visor Investigation for S1010 Helmet

Lamination of two pieces of acrylic with heating wires between two layers with additional option of using anti-reflectance coating on the inside. Currently only flat sheets being tested.

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